Problems Affecting Operations At The St. Louis Postal Data Center B-180235

United States Postal Service

UNITED STATES
GENERAL ACCOUNTING OFFICE

DEC. 10, 1974

UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

GENERAL GOVERNMENT
DIVISION

B-180235

The Honorable E. T. Klassen
Postmaster General
United States Postal Service

Dear Mr. Klassen:

This is our report on problems affecting operations at the St. Louis Postal Data Center.

We want to invite your attention to the fact that this report contains a recommendation to you which is set forth on page 11. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a written statement on actions he has taken on our recommendations to the House and Senate Committees on Government Operations not later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

Copies of this report are being sent to the Senate and House Committees on Appropriations, on Government Operations, and on Post Office and Civil Service and to selected Members of Congress. Copies are also being sent to the Director, Office of Management and Budget; the Administrator of General Services; the Director, National Bureau of Standards; and each of the Governors of the United States Postal Service.

Sincerely yours,

John D. Heller

John D. Heller
Acting Director

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ABBREVIATIONS

ADP	Automatic Data Processing
GAO	General Accounting Office
IBM	International Business Machines Corporation
OMB	Office of Management and Budget
PDC	Postal Data Center

GENERAL ACCOUNTING OFFICE
REPORT TO THE POSTMASTER
GENERAL

PROBLEMS AFFECTING OPERATIONS AT THE ST. LOUIS POSTAL DATA CENTER

United States Postal Service
B-180235

D I G E S T

WHY THE REVIEW WAS MADE

New automatic data processing (ADP) systems costing more than $10 million are being installed at four Postal Data Centers. In addition, the Service tentatively plans to spend $70 million more within the next 5 years for ADP equipment at other Postal Data Centers, ADP Centers, and certain large post offices.

To obtain an insight into these activities, GAO reviewed operations of the St. Louis Postal Data Center where the first new system was installed for $2.3 million.

FINDINGS AND CONCLUSIONS

Several problems existed in the Service's request for proposal and in its evaluation process for procuring the St. Louis ADP equipment. Unnecessary costs were incurred because the Service did not buy the equipment as economically as possible.

GAO's review showed that the equipment:

--Had been installed before the necessary preparations had been made to effectively use it.

--Could not handle the enlarged workload resulting from the Office of Management and Budget's (OMB's) decision to phase the Corps of Engineers out of Postal Service construction activities.

Problems in procuring ADP equipment

GAO previously reported to the House Committee on Post Office and Civil Service (B-180235, July 17, 1974) that:

--Deficiencies in the request for proposal and in the evaluation procedures worked to the advantage of the vendor awarded the contract.

--The Service did not use the best acquisition method available, nor did it adhere to its policy that substantive vendors' questions be answered and that copies of questions and answers be provided to all participating vendors. (See p. 4.)

Premature installation

A fundamental principle in acquiring computer systems is that equipment should not be installed until necessary programming, staffing, and other arrangements have been made for quick system utilization. This principle was not followed at St. Louis.

The Postal Service provided for the acquisition of new third generation computer equipment for

the St. Louis Data Center before the planned management information system had been developed, even though this system required complete revision of current computer files and programs.

The Center also delayed systems development to convert old programs being run on the second generation equipment for use on the new equipment. This delayed the benefits expected from the increased capacity of the new computer and resulted in additional costs.

However, 9 months after equipment installation, only about 25 percent of the programs to be converted were being productively run, and the Center had not yet started systems development work on the planned management information system.

Using the system to handle construction management activities has somewhat mitigated the effect of premature installation. (See p. 5.)

Equipment cannot handle enlarged workload

The types and quantities of ADP equipment acquired were based on the Center's projected workload as of July 1972, when the request for proposal was issued. The new equipment was contracted for in December 1972.

In March 1973, after the equipment was installed, the Center's workload increased considerably as a result of OMB's decision to phase the Corps of Engineers out of Postal Service construction activities.

Because of the phaseout, the Service had to assume certain construction and real estate management responsibilities previously handled by the Corps. The decision was made to use the Center's ADP equipment to fulfill this new duty, but it was not capable of handling the added workload. (See p. 7.)

RECOMMENDATION

GAO recommends that the Postal Service avoid acquiring additional ADP equipment for the Center until systems design has progressed to the point where future requirements can be precisely defined.

To meet the additional workload requirements, the Service should consider using time-sharing facilities on a short-term basis. (See p. 11.)

AGENCY ACTIONS AND UNRESOLVED ISSUES

GAO discussed this report with Postal Service officials who said policies and procedures had been established for, among other things, systems development and computer selection and acquisition.

In addition, a master plan is being developed to coordinate and establish guidelines for all Postal Service systems design and future ADP expenditures.

The Service has also established (1) an internal review function for all ADP systems to identify problem areas and to insure that objectives are being met and (2) a system to monitor installation and

conversion of other Postal Data Centers. The Service has initiated a study of the St. Louis ADP operation to determine current and projected workload requirements.

Tear Sheet

CHAPTER 1

INTRODUCTION

To help its managers maintain control and supervision over their operations, the Postal Service has installed new automatic data processing (ADP) systems at four Postal Data Centers (PDCs) with equipment costs of more than $10 million. In addition, the Service anticipates spending about $70 million more within the next 5 years for ADP hardware at other PDCs, ADP Centers, and selected large post offices.

The Postal Reorganization Act (39 U.S.C. 101) largely removed the Postal Service from budgetary and other controls exercised over most Federal agencies by the Congress and the Office of Management and Budget (OMB). The Service is exempt from the requirements of OMB Circular A-54, which contains policies and guidelines on selecting and acquiring ADP equipment 1/. The Service is also exempt from Public Law 89-306 (40 U.S.C. 759), which requires the General Services Administration to coordinate and provide for the economical and efficient purchase, lease, and maintenance of ADP equipment by Federal agencies.

The Postal Service has six PDCs--five regional PDCs in New York, Atlanta, Minneapolis, Dallas, and San Mateo, California, and one national PDC in St. Louis. Generally, the regional PDCs maintain accounting ledgers for their regions and provide systems development, maintenance support, and data processing services to the regions and to Postal Service headquarters.

EVOLUTION OF ADP IN THE POSTAL SERVICE

For many years the Postal Service has used mechanical and electronic data processing to augment manual accounting methods. This began in the late 1940's and early 1950's with punchcard accounting machines and has continued through first, second, and third generation computers. Computer operations and accounting were divided among 15 regional offices until 1964, when the functions were consolidated into 6 PDCs. Each of the centers was responsible for providing ADP support to an assigned region of the country.

1/ Under Executive Order 11717, May 9, 1973, certain OMB management responsibilities, including ADP management, were transferred to the General Services Administration. According to a General Services Administration official, new regulations for ADP selection and acquisition will soon be issued, which will contain requirements similar to OMB Circular A-54.

To improve its computer operations, the Service in 1966 replaced two small second generation computers at the St. Louis PDC with a medium-sized second generation Honeywell computer, the H-1200.

In 1971, the St. Louis Center was given responsibility for processing data that other PDCs had formerly handled. This made it unique among the PDCs in that it had responsibility for ADP systems relating to Service-wide operations. These systems cover the settlement of claims and the payments for transportation charges, leases, and vehicle hires.

The St. Louis PDC was also assigned responsibility for developing, maintaining, and operating the postal money order system. By February 1973, the Center had a division to manage and control postal money orders on a centralized basis. To handle this system, the Service leased an International Business Machines Corporation (IBM) 370/135 computer.

Procuring third generation equipment

In January 1972, the Service completed a feasibility study of ways to increase the capability of the St. Louis PDC. The study considered three alternatives:

--Modifying the existing second generation computer system (the H-1200).

--Acquiring equipment to supplement the existing system.

--Acquiring a large-scale third generation computer system to replace the existing one.

The study report recommended that the PDC acquire a new large-scale computer system that would support a new data base management information system to be developed to replace Service-wide systems.

This management information system would have required adding a telecommunications capability, increasing processing capacity, completely revising current data files and computer programs, and integrating these files with new applications. The H-1200 computer was to be released after a transition period, but the IBM 370/135 was to be retained for the postal money order system. In July 1972, the Service issued a request for proposal that described the same data base and information system requirements for new ADP equipment as reported in the feasibility study. In October and November 1972, the Service made a detailed cost analysis of vendor proposals. It selected the equipment proposed by IBM and awarded a contract on December 29, 1972, for an IBM 370/155 computer costing about $2.3 million. The new computer was installed at the St. Louis PDC in February 1973, and acceptance testing was completed in May.

In July 1973, the St. Louis PDC also assumed responsibility for supporting a Service-wide Facilities Management System--not considered in the feasibility study--which was being developed by a private contractor.

CHAPTER 2

PROBLEMS AFFECTING OPERATIONS AT THE ST. LOUIS PDC

At the St. Louis PDC, the Postal Service has experienced problems that have hindered the timely and efficient conversion from the H-1200 computer to the IBM 370/155 computer and the implementation of a management information system and the Facilities Management System.

We previously reported to the House Committee on Post Office and Civil Service (B-180235, July 17, 1974) on several problems in the request for proposal and the evaluation process used by the Service to procure the St. Louis PDC computer equipment (IBM 370/155). We found that unnecessary costs had been incurred because the Service did not use the best acquisition method available.

Our review of the ADP operations at the St. Louis Data Center showed that the equipment

--had been installed before all preparations had been made to effectively use it and

--could not handle the enlarged workload resulting from OMB's decision to phase the Corps of Engineers out of Postal Service construction activities.

PROBLEMS IN PROCURING ADP EQUIPMENT

In our report to the committee, we noted deficiencies in the request for proposal and in the evaluation procedures that worked to the advantage of the vendor awarded the contract. The request for proposal did not adequately describe the workload to be processed on vendor equipment and did not provide information on the criteria for evaluating proposals. However, the Service made the hardware, software, vendor support, and benchmark evaluations adequately.

We also reported that the Service did not (1) use the best acquisition method available, (2) consider all potential savings, or (3) adhere to its policy that substantive vendors' questions on the request for proposal be answered and that copies of questions and answers be provided to all participating vendors.

We noted that the Service was taking corrective actions to help alleviate the weaknesses discussed in our report.

PROBLEMS CAUSED BY PREMATURE ACQUISITION OF COMPUTER EQUIPMENT

OMB Circular A-54 requires that Government agencies be able to make productive use of computer equipment as soon as it arrives and becomes operational. Agencies must determine their ability to effectively use the equipment by conducting a readiness review before delivery and must set delivery dates accordingly. Although the Service is not subject to OMB requirements, this policy is sound, because it prevents premature acquisition of computer equipment.

The Service's feasibility study, however, provided for acquiring new computer equipment before developing the management information system, even though the system required complete revision of current computer files and programs. Because the Center delayed systems development to convert programs from the H-1200 to the IBM 370/155, the benefits expected from the new computer have been delayed and additional costs have been incurred.

The management information system was to be developed in three phases. Phase I was to require about 18 months following computer acquisition to among other things:

--design the data base,

--convert existing files to data base format,

--eliminate all unnecessary inputs and outputs from current operations, and

--develop processing modules for all existing applications.

Phase II was to implement the system's on-line capabilities, and Phase III was to consolidate and extend development of the first two phases.

As a result of these plans, the Service acquired the computer before (1) the management information system was designed, (2) the files were converted, or (3) the staff was sufficient to properly operate the equipment.

In addition, the Center postponed developing the data base for the management information system to convert programs from the H-1200 to the IBM 370/155. This merely required that existing H-1200 programs be translated into a language acceptable to the IBM 370/155. No significant changes were made in the processing logic, the file formats or organizations, or the formats of the output products. Generally, this type of conversion, similar to ones made by the Service in the past, does not realize the full potential of the new system. The feasibility study recognized this shortcoming; it concluded that quick conversions are shortsighted and that appropriate system redesign is a better alternative. This conversion was to enable the Center to release the H-1200

computer and reduce operating costs; however, it delayed development of the new system and increased costs, and the H-1200 has still not been released. The Service estimates that it will be released by the end of 1974, about 22 months after the IBM 370/155 installation.

Some of these programs are being converted under an April 4, 1973, contract, while others are being converted by the Center's personnel. As of November 30, 1973, the status of these conversions was as follows:

Status of programs	Converted by Contractor personnel	Converted by Center personnel	Total
Being tested on center equipment or under review	55	132	187
In full production	5	86	91
Conversions in process or not started	30	57	87
Total programs to be converted	90	275	365
Percentage in full production	6	31	25

Thus, 9 months after the new computer was installed, the Center had only about 25 percent of its programs to be converted in operation on the IBM 370/155. The design of the data base and conversion of existing files to data base format had not begun. When all of these programs are converted and in operation, the Center will merely be doing the same things it was doing with the H-1200 computer. It will not be taking advantage of the new computer's capabilities.

The early acquisition has been costly. When the Service develops the planned management information system, the programs currently being converted will have to be replaced or revised. We did not attempt to estimate any costs incurred for Center personnel efforts in the conversion process. Readily identifiable costs of acquiring the computer before it could be productively used are shown below.

	Amount
Contractor program transfers (total)	$ 81,000
Interest on $2.3 million investment in the computer, estimated at 7 percent	$161,000 annually
Maintenance cost	$ 67,000 annually
Depreciation on equipment, on the basis of 8-year life	$287,500 annually

In addition, at the time the computer was installed the Service did not have the staff called for in the feasibility study. The study provided for a basic staff of 34 analysts and programers to be augmented by 14

more persons by fiscal year 1973. As of December 1973, the Center had an authorized staffing of 29 people, only 25 of which were filled.

EQUIPMENT CANNOT HANDLE ENLARGED WORKLOAD

Beginning on March 11, 1971, the Service entered into a series of four agreements that transferred responsibility for postal construction, leasing, rental, and building improvement activities to the Corps of Engineers. However, the Director, OMB, advised the Service on January 26, 1973, that the Corps was to be phased out of Service real estate activities in two phases:

--Phase I, responsibility for minor construction, leasing, rental, and building improvement was to be transferred from the Corps by June 30, 1973--just 5 months after notification.

--Phase II, responsibility for major construction, including the National Bulk Mail System, was to be transferred from the Corps by June 30, 1974.

OMB officials said that the continuation and enlargement of the Corps' role in Postal Service activities had prompted them to order the phase-out.

On May 30, 1973, we reported to the Service that OMB's decision would delay completion of the National Bulk Mail System and would result in lost savings to the Service. Subsequently, the Service requested an extension of the Corps' participation in constructing the National Bulk Mail System, and on June 28, 1973, OMB authorized this extension until the system's completion.

In November 1972, the Service contracted with a private company to design, develop, and help implement a Facilities Management System--consisting of six subsystems--to provide the Service with management control over the entire facilities program. The system was to supply, among other things, certain historical, financial, and project status information. It was to use a data base rapidly accessible through telecommunications to many users at postal facilities.

As a result of OMB's decision, the Service had to quickly assume responsibility for minor construction, leasing, rental, and building improvements--representing a significant part of its real estate program. To meet this responsibility, the Service in March 1973 decided to implement, on the St. Louis PDC computer, a portion of the Facilities Management System, which was still being developed. Even though planning a Facilities Management System had begun in July 1972 in the Mail Processing Group (now the Real Estate and Building Department), the feasibility study and the request for proposal used to purchase the new computer hardware did not consider these plans.

The Service's decision to place the Facilities Management System on the St. Louis PDC computer has resulted in

--the development of two management information systems that cannot be integrated without modification and

--a delay in achieving the objectives of the feasibility study and the Facilities Management System due to a lack of adequate personnel and equipment.

Systems cannot be integrated without modification

According to the feasibility study, the management information system was to integrate a data base consisting of many different files, which could fulfill the reporting requirements of different management functions without repetitive processing. The system was to process transactions almost as soon as they were entered so the computer files would provide more current information. The integrated system would permit more than one data element to be updated by a single input and would have a telecommunications capability so information could be retrieved rapidly by remote users.

The Facilities Management System would also require integration of a data base and would make extensive use of telecommunications. The system is to provide quick response to special requests as well as produce recurring management reports. Although only two of the six subsystems have been implemented, the entire system will eventually be implemented on the St. Louis computer.

Although some data will be common to both systems, the data base management system used for the Facilities Management System will not be able to handle the management information system data base. The data base management system envisioned for the management information system in the feasibility study must be able to manage a large data base and directly access data, thus eliminating or reducing the need to search complete files to yield reports. The one used by the contractor for the Facilities Management System was selected because it was already in use in the Service's Western Region and was adequate for the relatively small facilities management data base. Additional funds must be spent and resources used to integrate the two systems into one data base.

Delay in achieving objectives

Because of the Service's decision to place the Facilities Management System on the St. Louis computer without making the necessary adjustments for the increased workload, the Center's resources were being strained. As a result, there has been a delay in (1) implementing the data base system envisioned in the feasibility study, (2) converting programs from the H-1200 computer to the IBM 370/155 computer, and

(3) implementing the Facilities Management System and demonstrating its reliability.

The Facilities Management System, although only about one-third implemented on the Center's computer, uses a substantial amount of computer resources. At the time of our review, it was on-line for 10 hours out of the 20-hour processing day. Its files occupied three of the eight available magnetic disk units during that period. The system's software and telecommunications requirements consumed respectively about 10 and 20 percent of the computer's main memory.

The computer had four data channels, only one 1/ of which connected the central processing unit to magnetic disk storage devices. The magnetic disks store all of the Center's programs, including general system software and Facilities Management System data. Thus, most applications to be processed on the computer competed for one channel. In June 1974, the Service added another channel costing $14,400 to help eliminate this competition.

As noted on page 6, the Center does not have sufficient staff to handle the increased workload. Center officials said that during the transition from second to third generation equipment, they were operating with too few operations people to cover all computers and also provide relief for the computer console operators and librarians.

This staff shortage has caused a relaxation of security provisions as noted in our February 28, 1974, report to the Assistant Postmaster General, Management Information Systems Department. At times, no operations personnel were on duty in the IBM 370 area, the tape library, or the vicinity of the computer room entrance. As a result of that report, the St. Louis PDC has tightened the security of ADP operations. Lack of sufficient personnel to adequately handle both the H-1200 computer and the IBM 370/155 and 370/135 computers has hindered development of the Facilities Management System and conversion and implementation of the management information system.

According to the feasibility study, converting the existing H-1200 computer files to data base format, designing the data base, and developing processing modules for all existing applications were to be completed within 18 months after computer installation, or about August 1974. By June 30, 1974, about 16 months after the computer was installed, the Center had not even begun any of this systems development. It had postponed development of the data base to convert to the IBM 370/155 programs being run on the H-1200 computer; however, even this conversion had not been completed.

1/ Two of the other three were required for tape drives and the other for controlling the printer, the card reader, and the communication lines connected to the computer.

In addition, the entire Facilities Management System was to be completed by May 1974, but, as of June 1974, only two of the six subsystems had been implemented. A third module is scheduled for full implementation in March 1975. According to a postal official responsible for the Facility Management System, the six subsystems are now scheduled for implementation by June 1976. He attributed the delay to a change in the scope of the contract to implement the subsystems necessary to handle the functions previously handled by the Corps and to the problems being experienced at the St. Louis PDC.

Facility Management System contractor officials were concerned about the St. Louis PDC's problems and its ability to properly support the system. They feared users may lose confidence in the system, thereby seriously damaging the entire facilities management program. They believe the addition of another data channel and more memory will enable the Center to properly support the first three subsystems but were not certain that the Center will be able to handle the entire system. They also said that a detailed analysis would have to be performed before such a determination could be made.

As recently as March 1974, two regional officials expressed dissatisfaction with the St. Louis support of the system operation. An official in one region estimated an average downtime of about 20 percent and said they could not effectively operate the Facilities Management System. An official in another region believed the St. Louis PDC lacked sufficient equipment capacity to run large programs. Contractor officials have also noted a lack of hardware capacity and have told us that the major problem at St. Louis is a lack of personnel and equipment resources. According to a headquarters official, the St. Louis computer system, as configured, may be insufficient to handle the anticipated workload of both the Facilities Management System and the management information system described in the feasibility study. He said, however, that because neither of the systems was fully designed, the eventual requirements could not now be determined.

A lack of planning and coordination between the group responsible for developing the Facilities Management System and the group responsible for operating the system has compounded the St. Louis PDC's problems. At about the same time that the request for proposal was issued for purchasing new computer equipment (July 1972), the Service was beginning to study the design, development, and implementation of the Facilities Management System. However, in acquiring the equipment in December 1972, the Service did not consider the possible impact of the Facilities Management System on the St. Louis computer requirements as set forth in the request for proposal.

In implementing the interim Facilities Management System, the Service also did not adequately analyze possible alternatives, such as the use of time sharing or the continued use of the H-1200 computer to handle existing applications. Although a Service official said that time sharing had been considered but rejected because of excessive cost and

the availability of the St. Louis computer, no formal analysis of this alternative was made. A factor other than cost that should have been considered is the disruption that would be caused in converting from the H-1200 operation, implementing the management information system, and meeting the objectives of the feasibility study.

CONCLUSIONS

We recognize that computing requirements cannot always be precisely predicted. For example, the Service had to unexpectedly assume responsibility for a significant part of their real estate program. As a result, the ADP equipment and personnel resources were unable to handle the enlarged workload or meet the objectives of the feasibility study and request for proposal. Because of this uncertainty, the original objectives and planning for computer capability should be reappraised throughout the developmental period.

To prevent premature acquisition of computer equipment, the Service should have procedures similar to those established by OMB requiring executive agencies to determine before delivery their ability to effectively use the equipment.

RECOMMENDATION TO THE POSTMASTER GENERAL

We recommend that no additional ADP equipment be acquired for the St. Louis Center until systems design has progressed to the point where present and future requirements can be precisely defined. To meet the additional workload requirements caused by assuming responsibilities previously handled by the Corps, the Service should consider using time-sharing facilities on a short-term basis.

CHAPTER 3

AGENCY ACTIONS AND GAO COMMENTS

We discussed the results of our review with Service officials who said that corrective actions have been and are being taken. In August 1974, the Service issued new policies and procedures for selecting and acquiring computer equipment and systems development. According to Service officials, these new policies and procedures closely follow those of the General Services Administration (formerly OMB; see footnote on p. 1). In addition, the Service is developing a 5-year master plan, to be issued by the end of 1974, to establish a comprehensive approach to fully use ADP technology within the Service. This plan will establish guidelines for all systems design and development and will set forth plans for future ADP expenditures.

The Postal Service plans to get users more involved in ADP activities by (1) assigning an ADP representative in each major operating group to coordinate ADP activities and identify possible management information needs, (2) assigning a technical assistant from the Management Information Systems Department to the user group to assist in preliminary design work after a need for ADP services has been established, and (3) establishing a "charge back" policy whereby users will be charged for ADP services in the hope of establishing more responsibility within the operating group.

Service officials have established an internal review function for all ADP systems to identify problem areas and to insure that objectives are being met, and that problems like those experienced at St. Louis do not occur at other PDC locations. In addition, a postal official said that a control system has been established providing for continual reporting of system installation and conversion activities at these other locations. He also said that proposals were being evaluated for time-sharing services at other PDCs with new computer equipment to avoid any recurrence of the problem created by the Facilities Management System at St. Louis. The Service is also studying the St. Louis ADP operation to compare workload requirements to equipment capacity.

To alleviate the problems in operating the Facilities Management System at St. Louis the Service has leased additional memory. According to postal officials, the Service may acquire additional hardware to upgrade the IBM 370/155 computer after the requirements analysis is completed.

We believe that these actions will correct many of the problems discussed in this report. However, before purchasing additional computer equipment, or placing additional applications on the computer, the Service should complete the detailed requirement study to identify total management information needs to avoid purchasing unnecessary or inadequate equipment. We plan to monitor the Postal Service's efforts to update and improve its ADP operations.

CHAPTER 4

SCOPE OF REVIEW

We reviewed the efficiency and effectiveness of ADP operations at the St. Louis PDC to determine whether these operations conformed with initial Postal Service plans. We made our review primarily at Postal Service headquarters, Washington, D.C., and at the St. Louis PDC. We

--evaluated policies, procedures, studies, and contracts relating to installing ADP systems at the St. Louis PDC and to selecting and acquiring third generation computer equipment for the Center;

--evaluated the ADP operations, including the program conversion to the new equipment and the operation and maintenance of the Facilities Management System; and

--interviewed Service officials at Washington, D.C., and St. Louis and officials of OMB, the General Services Administration, and the Facilities Management System contractor, Washington, D.C.

GLOSSARY OF TERMS

Automatic Data Processing (ADP)

Hardware or software devices or facilities contributing to collection, transmission, manipulation, and display of data.

Central Processing Unit

The part of the computer system hardware containing the arithmetic, logic, and control circuitry that interprets and controls the execution of instructions. The computer's main memory, though not technically a part of the central processing unit, is sometimes considered as such.

Data Base

Nontemporary data that is in a medium processable by computers and is available to a community of users.

Data Base Management System

A set of computer programs used to translate relatively simple user requests or instructions into detailed instructions and logic modules. It relieves users of the need to develop detailed procedures in computer code for solving problems and handling computer files.

Data Channel

A path from a peripheral device to the computer's main memory. Data to be input to or output from the computer's central processing unit must travel through a channel; competition for the channel may occur when more than one task is underway at the same time.

Direct Access Storage Media

A type of storage in which access can be made directly to any storage location regardless of its position or the location of previously referenced information.

Hardware

Machines or digital computers that are used to:

--Express data in a form compatible with further processing.

--Convert data into a medium compatible with telecommunications transmission.

--Relay data point-to-point between computers or between a computer and a connecting terminal.

--Interpret data that arrives by telecommunications and yield it in a form compatible with further computer processing.

--Edit data into report formats and provide printed reports or reports formatted onto a television screen.

--Process magnetic files to add to them, delete from them, modify them, compute them, and extract from them.

Immediately Accessible

Indicates data that can be found and used by a computer program almost instantaneously. Generally, the files of data are not in a library but on a direct access storage media device connected to the central processing unit by a data channel.

Information Systems

ADP systems that collect, assimilate, and display data in a format useful to management in planning, programming, and controlling operations. Information systems generally provide current and historical data, to aid decisionmaking.

Integration

Computer programs, data base management systems, and a data base on magnetic records, designed and maintained so that all departments of an organization can share common information, processing, and ADP resources to avoid unnecessary segmentation or duplication of effort.

Main Memory

High-speed magnetic or electronic storage medium used to hold data and instructions. Such information is immediately available to the central processing unit.

On-line

Computer programs or magnetic files that are either in main memory or direct access storage media immediately accessible to any processing demand.

Software

Instructions, expressed either as computer programs or routines, that instruct hardware in processing data.

Telecommunications

The means by which data intended for or prepared by a computer is transmitted over long distances; includes telephone wires, cable, radio waves, or a combination thereof.

Terminals

Hardware devices, usually remote from the computer, through which data can enter or leave the computer.

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